U. S. NUCLEAR REGULATORY COMMISSION

REGION V

SYSTEMATIC ASSESSMENT OF LICENSEE PERFORMANCE

SALP BOARD REPORT

Nos. 50-206/90-02, 361/90-02, 362/90-02

SOUTHERN CALIFORNIA EDISON COMPANY

SAN ONOFRE NUCLEAR GENERATING STATION

OCTOBER 1, 1988 THROUGH JANUARY 31, 1990

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U. S. NUCLEAR REGULATORY COMMISSION

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I. INTRODUCTION

The Systematic Assessment of Licensee Performance (SALP) is an NRC staff integrated effort to collect available observations and data on a periodic basis and to evaluate licensee performance based on this information. The program is supplemental to normal regulatory processes used to ensure compliance with NRC rules and regulations. It is intended to be sufficiently diagnostic to provide a rational basis for allocating NRC resources and to provide meaningful feedback to the licensee's management regarding the NRC's assessment of their facility's performance in each functional area.

An NRC SALP Board, composed of the members listed below, met in the Region V office on March 15, 1990, to review observations and data on the licensee's performance in accordance with NRC Manual Chapter 0516, "Systematic Assessment of Licensee Performance," dated August 16, 1989. The Board's findings and recommendations were forwarded to the NRC Regional Administrator for approval and issuance.

This report is the NRC's assessment of the licensee's safety performance at San Onofre for the period October 1, 1988 through January 31, 1990.

The SALP Board for San Onofre was composed of:

*R. P. Zimmerman, Director, Division of Reactor Safety and Projects, (Board Chairman)
*A. E. Chaffee, Deputy Director, Division of Reactor Safety and Projects
E. W. Merschoff, Deputy Director, Division of Reactor Safety, Region II
*C. M. Trammell, Acting Director, Project Directorate V, NRR
*S. A. Richards, Chief, Reactor Projects Branch
*G. P. Yuhas, Chief, Emergency Preparedness and Radiological Protection Branch
*P. H. Johnson, Chief, Reactor Projects Section 3
F. A. Wenslawski, Chief, Facilities Radiological Protection Section
*F. R. Huey, Chief, Engineering Section
M. D. Schuster, Chief, Safeguards Section
*J. E. Tatum, Unit 1 NRR Project Manager
*L. E. Kokajko, Units 2 and 3 NRR Project Manager
*C. W. Caldwell, Senior Resident Inspector
K. Prendergast, Emergency Preparedness Analyst
A. McQueen, Safeguards Inspector

* Denotes voting member (in all functional areas). Other persons advised the Board in areas of cognizance.

II. SUMMARY OF RESULTS

A. Effectiveness of Licensee Management

Notable licensee achievements were observed during this SALP period. Overall plant performance was good, with few transients and no significant complications. The number of reactor trips and other significant events was slightly higher than during the previous period, but still relatively low. Weaknesses were noted in the Plant Operations area involving insufficient attention to detail and inadequate training in normal operations, resulting in several operational errors during the assessment period. Other weaknesses were observed in association with non-conservative application or interpretation of Technical Specification (TS) requirements, and the staffing level of licensed operators was impacted by a higher than normal attrition rate.

In the Maintenance/Surveillance functional area, the Board considered the licensee to have defined a very effective Maintenance and Surveillance program, although minor weaknesses in program implementation were observed during the performance of maintenance activities. The licensee has also shown initiative in the Maintenance area by the use of innovative analysis techniques (e.g., Electronic Characterization and Diagnostics (ECAD) System). In addition, the licensee has demonstrated an aggressive Radiological Controls program which has served as an industry leader in several respects. Effective management controls, ample and capable staffing, and self-critical attitudes also provided good overall performance in the Emergency Preparedness and Security areas.

Strengths were also observed in other functional areas. In particular, the licensee was aggressive in upgrading programs to enhance the effectiveness of Engineering/Technical Support and Safety Assessment/Quality Verification activities. These efforts reflected strong management support of initiatives in these functional areas. Results were being achieved, as exemplified by significant design problems identified by Engineering and by meaningful audit/surveillance findings by the Quality Oversight organizations. However, weaknesses were also observed in these areas. In the Engineering/Technical Support area, problems were observed with regard to inadequate translation of the design bases to component setpoints, and in the lack of formal calculations for key design parameters related to some of the electrical distribution systems. In addition, there were a few examples of problems with design changes that manifested themselves in plant events. With regard to the Safety Assessment/Quality Verification area, weaknesses were observed in the adequacy of the corrective action program, safety evaluations, and licensing submittals.

The weaknesses noted above were discussed during periodic meetings with licensee management. These discussions emphasized a need for a continued self-critical attitude by SCE in addressing areas of weakness, particularly involving attention to detail during the

performance of work activities. In a manner indicative of such a self-critical attitude, senior SCE management recognized the significance of weaknesses observed during the last SALP period and initiated comprehensive actions to improve performance in the Engineering/Technical Support and Safety Assessment/Quality Verification functional areas. These efforts included a corporate reorganization to put all such activities under one Vice President, a move of the Engineering department closer to the San Onofre Station, relocation of all quality oversight organizations to the site, and initiation of a comprehensive review and updating of the plant's design basis documents.

B. Results of Board Assessment

Overall, the SALP Board found the performance of NRC licensed activities by the licensee to be acceptable and directed toward safe operation of the San Onofre Station. The SALP Board has made specific recommendations in most functional areas for licensee management consideration. The results of the Board's assessment of the licensee's performance in each functional area, along with the previous assessments, are as follows:

	Functional Area	Rating Last Period	Rating This Period	Trend*
A.	Plant Operations	1	2	
B.	Radiological Controls	1	1	
C.	Maintenance/ Surveillance	2	1	
D.	Emergency Preparedness	1	1	
E.	Security	1	1	
F.	Engineering/Technical Support	3	2	
G.	Safety Assessment/ Quality Verification	3	2	

* The SALP report may include an appraisal of the performance trend in a functional area for use as a predictive indicator. Licensee performance during the assessment period should be examined to determine whether a trend exists. Normally, a performance trend will be indicated only if (1) a definite trend is discernible and (2) continuation of the trend could result in a change in performance rating. The performance trend is intended to predict licensee performance during the next assessment period and should be helpful in allocating NRC resources.

C. Changes in SALP Ratings

Changes to the SALP ratings occurred in the Plant Operations, Maintenance/Surveillance, Engineering/Technical Support, and Safety Assessment/Quality Verification functional areas. Performance in

Plant Operations declined from the previous Category 1, primarily due to instances of non-conservative application or interpretation of Technical Specification requirements, and several events involving operator error. These events appeared to result from insufficient attention to detail and inadequate training in normal operations. A decreased licensed operator staffing level on Units 2 and 3 (due to a higher than normal attrition rate) also warrants management attention because of its potential impact on future plant performance in the Plant Operations area.

Performance in the Maintenance/Surveillance functional area was concluded to have improved due to a well-defined program and significant licensee initiatives in this area, including improvements in the control and scheduling of work, and the use of innovative maintenance techniques. Performance in this area was assessed as Category 1; nevertheless, the SALP Board noted several examples of problems associated with the implementation of that program. As a result, the Board recommends that the licensee continue to promote the concept of attention to detail during the performance of work, and strengthen supervisory review of work (including work plans) to assure that maintenance activities are performed safely and efficiently.

Performance was found to have improved in the Engineering/Technical Support and Safety Assessment/Quality Verification functional areas due to the licensee's aggressiveness in upgrading programs to enhance the effectiveness of these areas. These involved relocation of cognizant organizations closer to (or at) the site, additional staffing, and improved processes for performing and managing related activities. The Board noted strong management support of initiatives in these functional areas. The higher ratings reflect the Board's perception that desired notable improvements have been made in these areas, as discussed further in Sections IV.F and G, although a need for additional improvement was observed.

III. CRITERIA

Licensee performance is assessed in functional areas described in NRC Manual Chapter 0516. Appendix A to this manual chapter describes a number of attributes for each evaluation criterion and provides guidance on using these criteria to assign a performance rating. The evaluation criteria were as follows:

1. Assurance of quality, including management involvement and control.

2. Approach to the identification and resolution of technical issues from a safety standpoint.

3. Responsiveness to NRC initiatives.

4. Enforcement history.

5. Operational events (including response to, analysis of, reporting of, and corrective actions for events).

6. Staffing (including management).

7. Effectiveness of the training and qualifications program.

On the basis of the NRC assessment, each functional area evaluated was rated according to three performance categories. The definitions of these performance categories are as follows:

Category 1: Licensee management attention and involvement are readily evident and place emphasis on superior performance of nuclear safety or safeguards activities, with the resulting performance substantially exceeding regulatory requirements. Licensee resources are ample and effectively used so that a high level of plant and personnel performance is being achieved. Reduced NRC attention may be appropriate.

Category 2: Licensee management attention to and involvement in the performance of nuclear safety or safeguards activities are good. The licensee has attained a level of performance above that needed to meet regulatory requirements. Licensee resources are adequate and are reasonably allocated so that good plant and personnel performance is being achieved. NRC attention may be maintained at normal levels.

Category 3: Licensee management attention to and involvement in the performance of nuclear safety or safeguards activities are not sufficient. The licensee's performance does not significantly exceed that needed to meet minimal regulatory requirements. Licensee resources appear to be strained or not effectively used. NRC attention should be increased above normal levels.

IV. PERFORMANCE ANALYSIS

The following is the Board's assessment of the licensee's performance in each of the functional areas, along with the Board's conclusion for each area and its recommendations with respect to licensee actions and management emphasis.

A. Plant Operations

1. Analysis

During the SALP period, approximately 1770 hours of direct inspection effort were applied in the Plant Operations area. The licensee's strengths continued to be in well-written operating procedures, administrative controls, and operations support. A noteworthy accomplishment was a new site record for continuous operation set by Unit 3 shortly after the end of the assessment period. Weaknesses identified were associated with attention to detail and training in normal operations,

involving several personnel errors and instances of improper application of Technical Specification (TS) requirements. In addition, the staffing level of licensed operators was impacted by a high attrition rate. The licensee responded to these weaknesses, and corrective action plans were being developed at the end of the assessment period.

In response to the last SALP recommendations, the licensee took action to strengthen housekeeping and the interface among Operations, Maintenance, and Technical groups. Safety policies were reinforced through formal training and periodic reviews. Management continued to emphasize strict compliance with procedures, and took other actions to heighten the safety sensitivity of the operating staff. Corporate management was effectively involved in site activities and their presence in the plant was observed regularly, including during backshift hours. The licensee lowered the threshold for initiating operating incident investigations. This resulted in the assessment of more minor events for lessons learned. A general absence of recurring problems indicated that corrective actions for events and violations were effective.

The licensee's responses to NRC identified issues were technically sound, and implementation was timely and effective. One example was the development of a program, pursuant to an NRC Bulletin, to control plant evolutions with reduced reactor coolant system (RCS) inventory.

The trip reduction program appeared to remain effective, although the number of trips increased slightly over the previous period. Most were caused by equipment failures, such as those associated with Units 1 and 3 (as summarized in paragraph V.A). The Unit 2 CPC trip during startup, on the other hand, was attributed to operator error and training weaknesses. In addition, noise in the Unit 1 nuclear instrumentation system was identified by Operations, but was not effectively resolved with Engineering, later resulting in a reactor trip. In the case of manual trips, the operators took conservative actions and followed the procedures promptly when the adverse conditions were identified. The licensee's actions to analyze these events were aggressive and corrective actions were effective. In addition, the licensee initiated a professional operator development program to monitor and enhance operator performance.

In the licensee's approach to the identification and resolution of technical issues, there were several examples of non-conservative interpretation or implementation of TS requirements. Examples of this included (1) management misinterpretation of NRC Generic Letter 87-09, inappropriately allowing Unit 2 to be kept at power by invoking a 24-hour allowance to complete an overdue surveillance test, (2) not understanding that Unit 1 hot leg recirculation (HLR) was a

TS-required feature and that TS 3.0.3 was applicable when CV-304 failed, and (3) failure to reduce reactor power by 30% within an hour after a Unit 2 control element assembly slipped into the core. On the other hand, the facility staff did exhibit conservatism by shutting down Unit 1 to implement necessary modifications to the HLR system and shutting down Unit 2 when it was necessary to perform leak rate testing on the fuel transfer canal. In addition, equipment operability determinations made by Operations, in collaboration with Station Technical, were generally thorough and conservative.

Other weaknesses were observed in the Plant Operations area, as evidenced by occasional significant operating events that were attributable to causes under the licensee's control. One such event was a hydrogen ignition and fire in the radwaste building that resulted partly from program weaknesses and insufficient training for the control of combustible gases in plant systems. A number of personnel errors during routine plant evolutions were also attributed to insufficient attention to detail or to weaknesses in training on normal operations. Examples were a misunderstanding by the operators which led to Unit 2 being taken critical with all four channels of the core protection calculators (CPCs) indicated as being inoperable, and a draindown of approximately 700 gallons from the Unit 2 RCS by an equipment operator who manipulated the wrong valve during a reduced inventory condition.

With respect to staffing, responsibilities were well defined. To support the on-shift operators, the licensee had an experienced equipment control and procedure writing group that produced quality operating procedures and work requests in almost all cases. However, during this assessment period, the attrition rate for Unit 2 and 3 licensed operators increased to about double that of the previous year. While some of these operators were promoted within the Edison organization, thereby enhancing the depth of other organizations such as QA, many left the company. This caused some reduction in the experience base and increased the demand on the remaining operators. NRC enforcement action also focused attention on excessive use of overtime, by both Unit 2 and Unit 3 personnel, during the Unit 2 refueling outage. Toward the end of the period, the licensee initiated recruitment and training actions to improve licensed operator staffing levels.

The licensee's training and qualification program was well defined and implemented with dedicated resources and with effective means for feedback of industry and internal operating experiences. In particular, the program was effective in preparing personnel for NRC license examinations, as evidenced by near 100% pass rates for initial operating license candidates. Additionally, the administration of the licensee's requalification program received a satisfactory rating. However, while many operators examined exhibited strong

performance in handling abnormal operations, their performance for normal operations at times appeared to be weak, as evidenced during the requalification exams and by some of the events previously discussed. The licensee initiated corrective actions to address this deficiency.

The performance of the licensee's fire protection program during this period was consistent with NRC requirements, although resolution of several technical issues from the 1988 fire protection team inspection is still in progress. The licensee has maintained an effective firefighting capability, including a very capable onsite fire department, and has conducted frequent drills to ensure firefighter proficiency.

Inspection activities during the SALP period identified five severity level IV violations. Root cause analyses and corrective actions for the enforcement issues were timely and effective.

2. Conclusion

Performance Assessment -- Category 2

3. Board Recommendations

The Board recommends that management ensure continued use of a conservative interpretation and application of TS requirements. In addition, the licensee should provide continued management emphasis on procedure compliance, work control, and attention to detail. Continuing emphasis should also be given to strengthening licensed operator training and performance in routine plant evolutions, and to augmenting licensed operator staffing levels.

B. Radiological Controls

1. Analysis

This functional area was reviewed routinely during the assessment period by both regional and resident inspection staff. Approximately 530 hours of direct inspection effort were expended in this area. Strengths identified included comprehensive management control systems, particularly for ALARA (as low as reasonably achievable exposure) planning; many highly qualified staff personnel; an effective chemistry control program; and a commitment at the highest levels of management to improvements in quality. Housekeeping was aggressive, resulting in minimization of contaminated areas. Observed weaknesses evolved around inspector identified problems in the respiratory protection program, including training for dosimetry personnel, health physics department auditing techniques, and maintenance of respirators. The licensee aggressively pursued root cause evaluation and

correction of programmatic aspects of this issue. One additional weakness observed was the control of radioactive material, as indicated by several licensee-identified unplanned releases of low-level radioactive material and one instance of radiation dose rates in an unrestricted area above the limit. No problems were indicative of programmatic weaknesses in radiological controls.

Management control of planning activities continued to play a significant role in identifying problems before they became critical factors during maintenance. Health Physics management continued to meet frequently with their personnel, and conducted weekly tours of the plant and of ongoing work. Management commitment to improvement programs and to resolution of technical issues was responsible for a significant reduction in the failure rate for effluent and process monitors, resulting in increased availability of the monitors and fewer spurious challenges to engineered safety feature systems.

The licensee's staff continued to be a strength, with a low turnover rate, resulting in retention of highly qualified personnel. With the exception of supervision of the respiratory protection program, which had been delegated to personnel with other duties, responsibilities were well defined and personnel in staff positions demonstrated thorough knowledge of the technical aspects of their areas.

The licensee's training program remained accredited by the Institute for Nuclear Power Operations (INPO), with many instructors certified by the National Registry of Radiation Protection Technologists (NRRPT), and with a high number (near 100%) of ANSI qualified health physics technicians. The licensee has approximately 10 American Board of Health Physics (ABHP) certified health physicists. Management encouragement of personnel, through company-wide and departmental incentive programs for excellence and for ALARA improvement suggestions, maintained a high level of commitment to excellence by the plant staff.

Programs for chemistry analysis were very good as demonstrated by staffing, equipment, and procedures. Effective use and maintenance of condensate polishing demineralizers resulted in minimal chemical excursions in secondary systems. Routine quality control methods and fully independent measurement standards were effective, as demonstrated by a 98% success rate for initial analyses of NRC Confirmatory Measurements Program test standards.

The licensee's commitment to improvements in quality was exemplified by the correction of findings from internal audits, which were comprehensive. In the instance of a respiratory protection program audit which was found not to have been thorough in scope and depth, the licensee promptly instituted

changes to the program for conduct of health physics audits to improve audit techniques. Responses to NRC identified problems were timely and comprehensive, indicating a self-critical and conservative approach to correcting those problems.

Two cited violations were identified during this assessment period, as indicated in Table 2. This was a reduction from the three violations identified during the last SALP period. One was an isolated incident involving worker instructions in high radiation areas, which did not indicate a programmatic deficiency and was expeditiously corrected. The second was associated with respiratory protection problems, as mentioned earlier. However, the licensee's comprehensive commitments to correcting the root causes of the problem appeared to be sufficient to prevent recurrence.

The station's collective occupational radiation exposure for 1988 was 781 person-rem. This was up somewhat from the station goal of 750 person-rem, and the 697 person-rem achieved in 1987. The increase was attributed to extensive outage maintenance and plant aging. The licensee's solid radioactive waste disposal during 1988, of 97 cubic meters average per unit, was down slightly from recent previous years.

2. Conclusion

Performance assessment -- Category 1

3. Board Recommendations

The Board recommends that the licensee continue efforts to assure active participation of all site organizations in a quality Health Physics program, to improve the quality of health physics audits, and to maintain periodic retraining for health physics disciplines such as respiratory protection.

C. Maintenance/Surveillance

1. Analysis

During the SALP period, approximately 1750 hours of direct inspection effort were applied in the maintenance/surveillance area. In addition to routine inspections, a special maintenance team inspection was conducted to provide for an in-depth assessment of this area. An electrical Safety System Functional Inspection (SSFI) also reviewed the licensee's maintenance activities. The licensee's strengths continued to be in maintenance expertise, effective scheduling of surveillance tests, implementation of an effective computerized scheduling and work control system, and use of innovative maintenance technology applications. A noteworthy accomplishment was the well-executed transshipment of spent fuel from Unit 1 to the Units 2 and 3 fuel pools. The major

weakness identified was associated with continued instances of inattention to detail during the performance of work activities. The licensee recognized this weakness and continued to strive for excellence in this area.

In the previous SALP report, the Board recommended that emphasis on a high standard of performance by maintenance supervision and other personnel be continued, that better control over the conduct of maintenance activities be exercised, and that special attention be given to evaluation and documentation of discrepant conditions. In response to these recommendations, the licensee implemented several initiatives to perform tasks such as improving the quality of procedures (e.g., using more precise acceptance criteria) so that they were easier to use and understand. In addition, training was provided to promote a "do it right the first time" attitude, a self-assessment task group was formed within the Maintenance Division to continuously evaluate the quality of activities, and a review was conducted of discrepant conditions found by Division Incident Investigations and the nonconformance report (NCR) process. This appeared to result in the development of additional rigor in the maintenance process.

With regard to efforts to resolve technical issues, the licensee has been innovative in many cases by applying state-of-the-art technology and programs for maintenance. For example, SCE was one of the first utilities to use the Electronic Characterization and Diagnostics (ECAD) System. This was successfully used to locate an intermittent instrument cable ground fault that caused a reactor trip in Unit 1. This fault would have been almost impossible to locate without ECAD and could have caused another reactor trip later. The ECAD system was also used in the preventive maintenance program for the monitoring of electrical cables. The licensee also supported NRC initiatives by dedicating resources to assist the NRC's Office For Analysis And Evaluation Of Operational Data (AEOD) in development of maintenance performance indicators.

The licensee maintained a very effective surveillance scheduling program during this period, with only three missed surveillance tests for the three units.

A maintenance team inspection was conducted in July 1989 to determine the effectiveness of the maintenance program by applying Maintenance Tree methodology to the licensee's activities. The team found that the maintenance process for San Onofre was well defined and incorporated many current industry initiatives, reflecting strong management support and involvement. The team also considered that implementation of the program was satisfactory, but could be further strengthened. This was evidenced by several examples of inattention to detail in the development of maintenance work plans, failure to fully implement all steps of maintenance work instructions,

poor or untimely root cause analyses, and insufficiently developed or comprehensive corrective action plans. In addition, a weakness was also noted in pre-job walkdowns by planners. An example of this included the hydrogen fire that occurred during maintenance work on a waste gas relief valve. The licensee acknowledged these weaknesses and was addressing their resolution.

The maintenance team considered the licensee's training and qualification program to be well defined and to exceed established industry training criteria. The program provided good scheduling, documentation, feedback mechanisms, involvement of instructors in field activities, and training of supervision. In addition, the resident inspectors found the licensee's maintenance training facility to be well equipped for hands-on training. With respect to staffing, the maintenance team considered staffing for activities to be satisfactory, with some reservation regarding the adequacy of resources to address the workloads of work planners.

During this period, there were several operational events which occurred as a result of errors in the Maintenance/Surveillance functional area. In particular, a reactor trip in Unit 3 resulted from a non-1E uninterrupted power supply (UPS) fault because a temporary grounding cable was not removed upon completion of work performed during a previous SALP period (June 1988). In addition, several engineered safety feature (ESF) inadvertent actuations (other than emergency core cooling systems) occurred during the performance of surveillances as a result of personal error or equipment failure. These events were properly identified and analyzed, and were promptly reported where required.

Nine severity level IV violations and two deviations were cited in the Maintenance/Surveillance area during the assessment period. However, none of these indicated a programmatic breakdown and the licensee's root cause and corrective actions were effective and timely in most cases as evidenced by lack of recurrence.

2. Conclusion

Performance Assessment -- Category 1

3. Board Recommendations

The Board recommends that the licensee continue to improve implementation of the maintenance program, especially regarding attention to detail and procedural implementation. Efforts should also continue to strengthen the work order preparation and planning processes. Furthermore, the licensee should continue to strengthen supervisory review of maintenance

activities to assure that they are performed safely and efficiently.

D. Emergency Preparedness

1. Analysis

During this assessment period 180 hours of inspection effort were devoted to assessing the licensee's emergency preparedness program. This included two routine inspections and observation of the 1988 and 1989 annual exercises. The licensee received a SALP category 1 rating in this area during the last appraisal period. The last SALP board encouraged improvement in the areas of training and quality assurance.

Strengths identified during this assessment included upper level management's continued support of the emergency preparedness program. The only weak areas identified during this assessment involved minor repeat exercise findings during the 1989 exercise and some need for improvement in the shift crew's familiarization with the Emergency Plan implementing procedures. The licensee has been responsive to NRC concerns in these areas and has implemented improvements to the Training Program.

Management commitment to the Emergency Preparedness program was demonstrated by continued support of and participation in the licensee's drill and exercise program, and by significant improvements to the licensee's emergency facilities, including a new corporate support center, improvements to the Unit 1 operations support center, and improved telephone and computerized message systems. The actions by the Nuclear Affairs and Emergency Planning (NA&EP) Department to cultivate a cooperative interface with offsite agencies, including local governments, the state of California, and the U. S. Marine Corps, were also noted. This effort resulted in commendable participation by these agencies during the 1989 exercise, even though resources were then being expended in support of the San Francisco Earthquake and a large forest fire in the area.

The licensee's efforts to resolve technical issues from a safety standpoint have been conservative. For example, the licensee initiated a program to perform root cause analyses on all 1989 drill and exercise findings in an effort to improve performance and resolve previous exercise weaknesses.

Licensee management has demonstrated responsiveness to NRC initiatives. In response to Generic Letter 89-15, the licensee volunteered to participate in the NRC's Emergency Response Data System (ERDS). In addition, items identified by the NRC have been evaluated by management and acted upon. During the exit meeting for the 1989 exercise, several comments were brought to licensee management's attention for their consideration. The

licensee received the comments in a cooperative manner and responded promptly in writing by describing their evaluation and corrective actions. During another inspection conducted in 1989, it was noted that the shift crews' familiarity with their emergency procedures for classification and protective actions were in need of improvement. To this end, the licensee has provided a new full-time individual to the training program with expertise in emergency planning. This individual is to improve interface with the shift crews to increase their familiarity with their implementing procedures and provide feedback to Emergency Planning. The position also interfaces with the managers of other disciplines, including Health Physics and Maintenance, to insure their feedback and support of the drill and exercise program.

The licensee's audit program for the Emergency Preparedness area meets the regulatory requirements contained in 10 CFR 50.54(t) and was also noted to have improved in 1989. However, inspection findings shortly after the end of the assessment period indicated some weaknesses in the audit program.

Operational events were appropriately classified and no violations of NRC requirements were identified in the Emergency Preparedness functional area during this SALP period.

One Licensee Event Report (LER) was identified in the Emergency Preparedness area. This LER dealt with improper placement of fuse blocks for the emergency siren transfer switch.

The licensee continues to maintain adequate staffing levels with dedicated personnel to provide for the advancement of the Emergency Preparedness Program and to sustain a cooperative interface with local offsite agencies. Positions are identified and authorities and responsibilities are well defined. Few vacancies have occurred, and staffing continuity is considered a strength. Expertise is available "in house"; consequently, there has been little need for outside contractor support.

The licensee's training program is well defined, and utilizes computer-based training supplemented by an ambitious quarterly drill and exercise program. The drill program was observed to have been improved during this SALP period by the utilization of more challenging scenarios. Increased emphasis was also placed on the documentation of drill and exercise findings and on the program to identify the cause of the finding to preclude recurrence. Weakness was observed, however, in the licensee's exercise critique program. As discussed during the NRC exit for the 1989 exercise, providing the players with a copy of the scenario prior to the critique may provide benefits.

2. Conclusion

Performance Assessment -- Category 1

3. Board Recommendation

Continued support of the licensee's drill and audit programs is recommended to improve the implementation of corrective actions and reveal areas for improved performance.

E. Security

1. Analysis

During this SALP assessment period, Region V conducted three physical security inspections and one material control and accountability (MC&A) inspection at the San Onofre Nuclear Generating Station. Approximately 310 hours of direct inspection effort (including 68 hours for MC&A) were expended by regional inspectors. In addition, resident inspectors provided continuing observations in this area.

Corporate and plant management continued to be involved in assuring quality and in reviewing the operation of the overall security program. This remained a strength, as in the previous SALP period. This was further reflected in the licensee's approach to the identification and resolution of technical issues from a safety, as well as a security, standpoint.

Two violations, one licensee identified and not cited, were indicated during the SALP period. One violation pertained to an item of security equipment required to be protected as vital being located outside vital areas, and the other pertained to an individual being allowed access to a vital area without appropriate processing. Both appeared to be isolated incidents not previously encountered by the licensee. The licensee reported 13 events, of which four pertained to security and nine pertained to Fitness for Duty incidents.

The licensee submitted copies of the safeguards event log on a quarterly basis as required, indicating a total of 411 logged security events attributed to both human and hardware failures. The licensee empaneled a Security Section Safeguards Event Review Committee to meet regularly and review each of the logged events. Trends were established and responsibility was assigned to an appropriate individual for each type event to perform the necessary study, design, engineering, construction, training, or other action necessary to correct the problem and preclude or reduce its recurrence.

Performance appeared mixed in the area of responsiveness to NRC initiatives during the period. On one side, licensee action in response to an NRC generic letter (requiring licensees to plan

to react to a vehicle bomb threat against their facility) appeared outstanding. The licensee not only went to great lengths to ensure a thorough and comprehensive response to such a threat, but went on to physically test the entire response plan and all elements. On the other hand, response to NRC initiatives or findings pertaining to vital area (VA) barriers at the site appeared less prompt. An NRC information notice issued in 1987 advised all licensees to review their VA barriers for suspected penetrations to assure conformance to existing requirements. The licensee did an excellent job in reviewing barriers and properly identified a number of openings or penetrations through the barriers. Several of these openings were concluded to require corrective measures. This corrective action has been ongoing and is currently programmed for completion during the next SALP period. Similarly, an NRC Regulatory Effectiveness Review (RER) indicated weaknesses in Unit 1 VA barriers in 1985. At that time, the licensee concluded that the barriers had "been formally reviewed and approved as described in the San Onofre Physical Security Plan" and that the continued use of such barriers was reasonable. At the end of this SALP period, the licensee indicated that they would again review these barriers to assess the RER-indicated weaknesses for possible amelioration.

Licensee staffing of the security program has been a strength during this period as it was during the previous SALP period. Personnel appeared to be carefully screened for experience and training. The security organization appeared well defined, with areas of responsibility and authorities appropriately detailed. Decision making authority appeared to be properly delegated to assure quick identification of and response to problems and changes. A program of security manning reductions was initiated during this SALP period. As of the end of 1989, 14 personnel reductions had been made in the security organization, with a goal of 21 by the end of 1992. The licensee indicated that these reductions are being closely reviewed and managed to ensure that there is no impact on compliance or security organization commitments.

Remaining a strength from the previous SALP period was the licensee's security training and qualification program. Instructors appeared highly qualified and motivated. The licensee has also recently enhanced security training for armed personnel by encouraging quarterly practice firing of assigned response weapons.

2. Conclusion

Performance assessment -- Category 1

3. Board Recommendations

The Board recommends that the licensee continue to support security program enhancements; e.g., the licensee initiative to assess and ameliorate Unit 1 Vital Area barrier weaknesses.

F. Engineering/Technical Support

1. Analysis

During the SALP period, approximately 330 hours of direct inspection effort were applied in the Engineering and Technical Support area. In addition to this inspection effort by resident and region-based inspectors, an NRC Safety System Functional Inspection (SSFI) team performed an inspection of Units 2 and 3. The major strength identified during this assessment period was the licensee's aggressiveness toward upgrading programs to enhance engineering and technical performance. The major weaknesses in this functional area involved inadequate translation of the design bases to component setpoints, and the lack of formal calculations for key design parameters related to some electrical distribution systems. In addition, there were a few examples of problems with design change output that resulted in plant events.

In response to problems identified in this area during the last SALP, licensee management initiated many enhancements to improve engineering performance and the quality and completeness of design basis documentation. The Nuclear Engineering, Safety, and Licensing (NES&L) organization was reorganized and relocated to Irvine to enhance the effectiveness of the engineering organization in communicating with the site. In addition, the licensee was increasing the in-house design effort to minimize the use of contractor engineering support, and was expecting that all engineering work for the 1990 Unit 1 refueling outage would be performed in-house. An Engineering Excellence program was also implemented during this assessment period to promote development of engineering standards, expand and formalize design review functions, improve communications and work processes, enhance design engineer training programs, and monitor the results of engineering work to assess the degree of quality improvements.

The licensee also instituted a program for enhanced understanding of the design basis. This design basis document (DBD) review will include a review of the design basis for selected systems and a design document transfer from vendors to SCE. The licensee expects that approximately 94 systems and topical areas will have been reviewed when the DBD effort is completed after about five years.

With respect to design changes, problems became evident in the middle of the assessment period due to three events related to

instrumentation upgrades performed during the Cycle X refueling outage in Unit 1. These were (1) a reactor trip during restart caused by electrical circuit noise in the new nuclear instrument (NI) system (reflecting insufficient analysis of conditions observed before startup); (2) an automatic actuation of the auxiliary feedwater (AFW) system (because engineers overlooked the dynamic flow effects in the steam generator and had not properly involved the nuclear steam system supplier in the design process); and (3) a manual reactor trip which had to be initiated because of a loss of feedwater flow (due to failure to properly reflect design change information in surveillance procedures).

To improve engineering output, the design change process was being revised to better define the scope of work and to provide for more thorough reviews of each change from its initial conception to final approval. This program should be fully implemented for the Unit 1 Cycle XI refueling outage scheduled for the summer of 1990. Although the design change process was still in transition at the end of the assessment period, it appeared that the performance of design changes was under effective control.

Staffing appeared to be strained at times during the assessment period, as evident by the amounts of overtime used. However, additional engineering personnel had been added by the end of the period, in support of the licensee's efforts to assume a stronger in-house engineering role.

The licensee was actively participating in industry efforts to improve the scope and content of training for the design engineering staff and has developed a Nuclear Engineering Organization training plan. The licensee also developed a cognizant (plant technical) engineer training program during the period. Both training programs consist of general and site specific training designed to provide information for all disciplines. These actions were notable, although somewhat slow in implementation.

The November 1989 electrical SSFI conducted for Units 2 and 3 identified a number of specific deficiencies and two general areas of weakness in this functional area. These involved (1) weaknesses in the translation of design bases into component setpoints (e.g., diesel day tank level setpoints that were below the TS requirements), and (2) lack of formal calculations for key design parameters related to several electrical distribution systems (e.g., missing or inadequate calculations for diesel generator load, 120 VAC control power voltage regulation, and containment penetration sizing and protection). Calculations also did not show that the D/G air receivers had sufficient capacity to support five automatic starts (an FSAR commitment).

The NRC maintenance inspection team reviewed several engineering evaluations and found them to be adequate. The team considered that the engineering/technical support program and its implementation were satisfactory. However, some weaknesses were noted in engineering performance, as evidenced in insufficient design data or analyses. In addition, insufficient attention to detail was noted involving pressure ranges used in calibration of feedwater flow transmitters.

Weaknesses in safety evaluations were noted in several cases. For example, during startup from the Unit 1 Cycle IX refueling outage, the licensee determined that no unreviewed safety question (USQ) existed for S/G tube sleeve deficiencies. However, this determination was made without an assessment of the thermal hydraulic response of an improperly sleeved tube and the potential consequences during a steam line break accident. A subsequent assessment during the Cycle X refueling outage showed that operation in this manner was a USQ. A second example concerned a safety evaluation for an inadequate weld process that resulted in several leaking S/G tube plugs in Unit 2. In this case, an evaluation was not prepared to substantiate return to operation without repairing other plugs that had potential for similar weld deficiencies. By the end of this assessment period, the licensee was focusing attention to improve the quality of safety evaluations.

NRC inspections identified one violation and two deviations in this functional area, but these did not indicate significant weaknesses. A total of 29 LERs were associated with Engineering and Technical Support activities. Most of these involved system design inadequacies or personnel errors in the engineering process that led to deficiencies which were primarily found in Unit 1. Many of these LERs reflected deficiencies in early design work which were identified through more aggressive efforts by engineering to verify the design basis of systems, or by a more critical attitude during the performance of design work. These efforts identified a number of significant design inadequacies such as Unit 1 safety injection alignment delays and a lack of backup nitrogen for recirculation system and containment spray system valves.

2. Conclusion

Performance assessment -- Category 2

3. Board Recommendations

The Board recommends that the licensee continue to emphasize the design basis update program and strengthening of in-house engineering capabilities. In addition, efforts to improve engineering and technical work should continue, and the licensee should ensure that calculations in support of

setpoints and key design parameters of systems are accurate and properly maintained.

G. Safety Assessment/Quality Verification

1. Analysis

During the SALP period, approximately 1700 hours of direct inspection effort were applied in this functional area. The major strength identified during this assessment period was the licensee's aggressiveness in upgrading programs to enhance performance in this area. In addition, enhancements were made in the communication of problems to the NRC. Weaknesses in this functional area were associated with the adequacy of the corrective action program, safety evaluations, and licensing submittals.

In response to findings during the last SALP period, the licensee implemented or upgraded several programs to enhance performance in this area. The area monitoring program (AMP) was enhanced to provide a systematic method for directly observing the implementation of QA program requirements so that all oversight organizations could participate in monitoring activities. This included evaluations of material condition, temporary modifications, and housekeeping of assigned areas. In addition, monitoring programs were implemented to provide more direct observation of work performance, and resulted in meaningful findings (e.g., problems with pipe supports in the turbine building). These programs reflected a more performance-based review by quality oversight groups. Increased presence of quality oversight personnel and management was noted in the plant, and the remaining offsite safety oversight groups were relocated to the site to enhance their effectiveness.

The QA audit and surveillance programs were revised during this period to focus more directly on performance. Audit plans received more in-depth reviews, and the scope of audits was better defined. Followup documentation for audits and surveillances provided a more thorough evaluation of conditions found during the review, and corrective action requests were issued for findings. Problems identified included inadequate control of crimpers and improper overpressure mitigation system setpoints for the Unit 1 power-operated relief valves. Although these programs appeared to be developing well, problems such as non-conservative TS interpretations by Operations or deficiencies with the corrective action program (discussed below) were not challenged by QA until after the NRC raised concerns in these areas.

The licensee focused increased emphasis on training and qualification, with particular emphasis on quality assurance personnel. All auditors and inspectors, including quality

control inspectors, were given additional training on the conduct of performance based inspections. This training, coupled with increased in-plant inspections and focus on safety-significant matters, reflected substantial management support for the enhancement of performance in this area. Higher management expectations and identified weaknesses in knowledge levels resulted in downgrading of the qualifications of approximately 30% of the auditors. Retraining of the personnel was in progress through the use of an auditor certification program, which was implemented to enhance the knowledge level of new personnel and to recertify previous auditors. Staffing was also enhanced in most quality oversight groups. This included raising the experience base by adding some licensed operators and other experienced personnel to the quality assurance organization.

The root cause assessment program was in the process of being enhanced to increase effectiveness. Although root cause assessments will continue to be performed largely by the cognizant organizations, overall program responsibility was assigned to the Manager of Oversight Engineering. This new position was established within the Oversight Organization to provide the methodology, training, and assistance for root cause determinations, and to provide oversight of root cause determinations conducted by the other organizations. This manager will also direct the efforts of the Independent Safety Engineering Group, the Nuclear Safety Group, and the Quality Engineering Group. Although progress was initially slow, momentum had been established by the end of the SALP period, and this program is expected to be fully implemented by the spring of 1990.

The maintenance team inspection found a number of examples of weaknesses in this functional area. These examples included weak root causes for several problem reports, excessive use of the category "unknown" (in classifying root causes for some nonconformance reports), and insufficient priority for and tracking of the resolution of several NRC inspector-identified findings, particularly involving in-service inspection (ISI) issues in Unit 1. The licensee was actively pursuing corrective actions to resolve these problems, as discussed previously.

A problem concerning a solenoid valve failure (Unit 1 valve CV-304) that resulted in a diversion path for hot leg recirculation flow led to the identification of a number of weaknesses with the licensee's corrective action program. Reviews by the resident inspectors and the licensee's QA organization found a number of related problems, including inadequate dissemination of information about component problems to the necessary organizations for review, lack of timely resolution of root cause determinations, inadequate follow-through on commitments made in LERs, improper oversight

of outstanding items, and inadequate review of component failures for generic implications. In addition, it was noted that the licensee did not routinely evaluate site component problems for 10 CFR Part 21 applicability. The QA organization performed an in-depth analysis of this issue and found additional problems with the corrective action program. The licensee was aggressively pursuing resolution of these issues.

A weakness was also identified with inadequate or non-conservative safety evaluations performed during the period. For example, the licensee did not promptly document a wall thickness problem involving residual heat removal (RHR) system piping (a condition identified by ultrasonic measurements), and a 10 CFR 50.59 review for changes to the intermediate range startup rate trip did not result in the submission of a required TS amendment request for a system change which blocked the trip function at less then 10^{-4}% power. The licensee was working to enhance safety evaluations and was in the process of implementing the associated guidance provided in Nuclear Safety Analysis Center (NSAC)-125.

Problems were noted with the adequacy and control of LERs. In particular, there were three LERs early in the period that did not appear to have fully addressed the applicable root causes and corrective actions for the associated events. In addition, it was identified in association with the CV-304 solenoid valve failure (discussed previously) that a relatively large number of LERs requiring supplemental reports were long outstanding. LER quality improved toward the end of the assessment period, and the licensee was attempting to reduce the backlog of supplemental LER reports due to the NRC.

Licensing submittals received at the beginning of the period were at times lacking in thoroughness and depth, resulting in the need for repeated submittals to and conferences with the NRC. Examples included the single failure analysis submittal for the Unit 1 reactor protection system (RPS) and engineered safety features (ESF), and the Unit 1 thermal shield degradation submittal. In addition, the NRC noted instances of the licensee's inability to adequately identify, plan, and track licensing actions. Examples included the Units 2 and 3 spent fuel pool re-racking amendment, and the Unit 3 low temperature overpressure (LTOP) mitigation system amendment. Also, there were delays in submitting many licensing documents and related correspondence throughout the period. Improved quality of licensing submittals was noted toward the end of the assessment period. Among these was the licensee's October 2, 1989 submittal which addressed full term operating license (FTOL) open items. In this submittal, the licensee provided a schedule for resolution of these items. In addition, at their own initiative, the licensee committed to make improvements to both the recirculation portion and the injection portion of the safety injection system.

During this period one level V and four level IV violations were identified, but these did not indicate significant flaws in the licensee's programs.

2. Conclusion

Performance assessment -- Category 2

3. Board Recommendations

The Board recommends that the licensee continue to implement and improve the root cause assessment program. In addition, efforts to improve 10 CFR 50.59 safety evaluations and the corrective action program should continue to ensure that problems are adequately and timely resolved. Continued efforts should be devoted to ensuring that conservatism is exhibited in the making of operational decisions. Continued emphasis should also be given to the quality and timeliness of licensing submittals.

V. SUPPORTING DATA AND SUMMARIES

A. Licensee Activities

In general, all three units operated satisfactorily during the assessment period and were relatively free of problems. Specific operational activities were as follows:

Unit 1

Unit 1 began the Cycle X refueling outage in November, 1988. Some of the major plant modifications completed during that outage included the installation of a new nuclear instrumentation system (NIS), reconfiguration of the auxiliary feedwater (AFW) system to include a dedicated safe shutdown train, installation of upgraded steam generator (S/G) instrumentation, and upgrades to other systems which were identified as being vulnerable to single failure. The licensee attempted to return the Unit to service in May, 1989; however, a number of difficulties were encountered over a period of three months. Those difficulties included the following:

- An automatic reactor trip (while in Mode 2) due to electrical noise in the newly installed NIS;
- A manual shutdown during power ascension due to a level anomaly in the modified S/G instrumentation, which resulted in an automatic initiation of AFW;
- A manual shutdown from power to repair the cause of a high bearing temperature in one of the reactor coolant pumps (RCPs);
- A manual trip from power when a loss of feedwater occurred during a surveillance test;

- An automatic trip from an erroneous reactor coolant system low flow signal, caused by a grounded instrument cable; and

- A manual trip when multiple rods dropped into the core due to faulty relays.

After these problems were corrected (each in turn) the Unit operated trouble-free at power from September through November, at which time it was shut down to make modifications to the hot leg recirculation flow path (after design deficiencies were identified). After the Unit was returned to service, it was again shut down in December to correct problems with backup nitrogen for a safety injection valve. The Unit was subsequently restarted and operated at power through the remainder of this assessment period.

Unit 2

Unit 2 operated at power from the beginning of this SALP period until January 1989, when it was shut down to repair an AFW pump motor. The Unit was restarted in February even though lighted annunciators indicated all four Core Protection Calculators (CPCs) to be inoperable. This was recognized by operators during the startup, and a shutdown was initiated. The CPCs were fully operable, however, and initiated a reactor trip as the reactor was being shut down (because operators did not place the trip function in bypass). After restart, Unit 2 operated at power until May 1989 when it was shut down to repair a S/G tube leak. The Unit was subsequently returned to service in June and was operated at power until September, when it was shut down for the Cycle V refueling outage. As the reactor was being shut down for the refueling outage, it had to be manually tripped from 25% power when operators realized that the axial shape index was approaching the CPC automatic trip setpoint. A number of major activities were performed during the 97-day refueling outage, including the following:

- Control room modifications for human factors improvements;

- Turbine overhaul;

- Installation of an anticipated transient without scram (ATWS) diverse reactor trip;

- Overhaul of main feedwater heaters; and

- Main transformer replacement.

In December 1989, shortly after startup following the refueling outage, the Unit was shut down to repair a main feedwater flow venturi flange leak. The Unit was then returned to service and operated at power through the remainder of this assessment period.

Unit 3

Unit 3 was operating at power at the beginning of this period. An automatic reactor trip occurred in January 1989, due to a low S/G level caused by a loss of non-1E power for the feedwater controller. After return to service from the short outage, the Unit operated until April 1989, when it tripped automatically due to a low voltage condition associated with power to the control element drive mechanism relays. After return to power operation, the Unit was shut down in July to repair a low pressure safety injection (LPSI) pump seal leak. After the return to service following this repair, the Unit operated continuously at power for the remainder of this assessment period. Shortly after the end of this SALP period, the Unit exceeded the site's continuous operation record of 218 days set by Unit 1 in 1976.

B. Direct Inspection and Review Activities

Approximately 6570 inspection hours were expended during this assessment period in performing a total of 46 inspections by resident, region-based, headquarters, and contract personnel. Inspection activity in each functional area is summarized in Table 1.

C. Enforcement Activity

Three resident inspectors were onsite during the SALP assessment period. A total of 46 inspections, including a maintenance team in June and July 1989, and an electrical SSFI in October and November 1989, were conducted during this period for a total of 6395 inspector hours (plus 259 hours invested in exit and management meetings). A summary of inspection activities is provided in Table 1, along with a summary of enforcement items identified during these inspections. A description of enforcement items is provided in Table 2. A synopsis of licensee event reports is included as Table 3.

D. Confirmation of Action Letters

One Confirmation of Action Letter was issued during this assessment period, on January 31, 1989. This letter confirmed the licensee's plans to resolve questions regarding Unit 1 thermal shield integrity and other technical issues, and to obtain NRC concurrence before restart of Unit 1 from its Cycle X refueling outage.

E. Orders

An Order requiring full compliance of Unit 1 with Generic Letter 82-28, "Inadequate Core Cooling Instrumentation System" was issued on May 5, 1989.

An Order Confirming Licensee Commitments On Full-Term Operating License Open Items For Unit 1 was issued on January 2, 1990. This order confirmed SCE's commitment to complete the full-term operating

license open items pursuant to the schedule described in a letter from the licensee dated October 2, 1989. In addition, this Order modified the NRC's previous order dated May 10, 1989, to require that the reactor vessel level indication system be installed during the Cycle XII refueling outage instead of the Cycle XI refueling outage. This Order also confirmed that the licensee would conduct a S/G tube inspection during the Cycle XI refueling outage.

F. AEOD Assessment of Licensee Event Reports

A review of licensee events at San Onofre, performed by the Office for Analysis and Evaluation of Operational Data (AEOD), is included as Attachment 1. AEOD reviewed the LERs and significant operating events for quality of reporting and effectiveness of identified corrective actions.

TABLE 1

INSPECTION ACTIVITIES AND ENFORCEMENT SUMMARY

Functional Area		Inspection Hours	Percent of Effort	Enforcement Items* Severity Level I	II	III	IV	V	Dev
A.	Plant Operations	1772	26.7				5		
B.	Radiological Controls	530	8.2				2		
C.	Maintenance/ Surveillance	1751	26.7				9		2
D.	Emergency Prep.	180	2.7						
E.	Security	310	4.7				1		
F.	Engineering/ Technical Support	332	5.2				1		2
G.	Safety Assessment/ Quality Verif.	1697	25.8				4	1	
	Totals	6572	100.0				22	1	4

* Severity levels are discussed in 10 CFR 2, Appendix C.

** In addition, 259 hours were expended in exit and management meetings.

This information is current through inspection reports 206/90-05; 361/90-05; and 362/90-05.

TABLE 2

ENFORCEMENT ACTIVITY

UNIT 1

Inspection Report No.	Subject	Severity Level	Functional Area
88-24	Inadequate Control of Maintenance Activities on Environmentally Qualified Equipment	IV	C
88-28	Failure to Use Proper Procedure Revision for Performing Reactor Coolant Chemistry Sampling	IV	C
89-01	Failure to Comply with Foreign Material Exclusion Control Requirement	IV	C
89-03	Inadequate Nonconformance Report on Residual Heat Removal Pipe Wall Thickness	IV	G
89-08	Inadequate Control of Radioactive Material	IV	B
89-09	Inadequate 10 CFR 50.59 Review Regarding Nuclear Instrumentation System Block of Start-up Rate Trip	IV	G
89-16	Emergency Lighting Not Performed Per Updated Final Safety Analysis Report	Dev	F
89-16	Nonconformance Report Failed to Identify Root Cause	IV	F
89-16	Failure to Perform Calibration and Test	IV	C
89-18	Temporary Cables Routed With Safety Related Cable Trays	IV	C
89-28	Failure to Verify or Properly Maintain a Procedure for Respirators #	IV	B
89-31	Inadequate Corrective Actions Related to Failure of Automatic Switch Corporation Solenoid Valves	IV	G

Table 2, Enforcement Items (Continued)

UNIT 1

Inspection Report No.	Subject	Severity Level	Functional Area
89-31	Failure to Comply with Technical Specification 3.0.3 by Initiating Plant Shutdown Within One Hour When Normal Hot Leg Recirculation Flow Path Inoperable	IV	A
90-01	Failure to Resolve Issues of In-service Testing Program For Pumps Bounded By the Safety Analysis #	Dev	C

Applies to Units 1, 2, and 3

UNIT 2

Inspection Report No.	Subject	Severity Level	Functional Area
88-25	Inadequate Calibration Program for Safety Related Alarm Devices ##	IV	C
89-06	Failure to Report Condition that Resulted in Violation of Technical Specification Requirements ##	V	G
89-09	Housekeeping in 2/3 Electrical Cabinets and Electrical Maintenance (Unit 3) ##	IV	C
89-11	Adequacy of Corrective Actions Regarding 10 CFR 50.49 Equipment Qualification Discrepancy ##	IV	G
89-16	Work Authorization Request Released Improperly and Poorly Maintained	IV	C
89-18	Atmospheric Dump Valve Inoperable for Automatic Operation	IV	A
89-24	Failure to Declare Equipment Inoperable Due to Delinquent Surveillance	IV	A

Table 2, Enforcement Items (Continued)

UNIT 2

Inspection Report No.	Subject	Severity Level	Functional Area
89-24	Lack of Control Over Temporary Cables Routed through a Control Room Emergency Air Cleanup System Door ##	IV	C
89-30	Failure to Implement Periodic Ground Check on Reactor Protective System and Engineered Safety Feature Actuation System	Dev	C
89-33	Excessive Overtime Usage	IV	A
90-03	Security Equipment (Required To Be Protected) Located Outside Vital Area ##	IV	E

Applies to Units 2 and 3

UNIT 3

Inspection Report No.	Subject	Severity Level	Functional Area
89-06	Failure to Control Technical Specification Fire Doors	IV	A
89-16	LPSI Pump Seal Leakage Drain Piping Not Installed As Indicated in the Updated Final Safety Analysis Report	Dev	F

Functional Areas

A - Plant Operations
B - Radiological Controls
C - Maintenance/Surveillance
D - Emergency Preparedness
E - Security
F - Engineering/Technical Support
G - Safety Assessment/Quality Verification

TABLE 3A - Unit 1

SYNOPSIS OF LICENSEE EVENT REPORTS (LERs)

Functional Area		SALP Cause Code* A	B	C	D	E	X	Totals
A.	Plant Operations	4				7		11
B.	Radiological Controls	2						2
C.	Maintenance/ Surveillance	2			3			5
D.	Emergency Prep.				1			1
E.	Security **	8				1		9
F.	Engineering/ Technical Support	7	14		1			22
G.	Safety Assessment/ Quality Verif.					1		1
	Totals	23	14		5	9		51

* Cause Code
- A - Personnel Error
- B - Design, Manufacturing or Installation Error
- C - External Cause
- D - Defective Procedures
- E - Component Failure
- X - Other

** Security LERs are applicable to Units 1, 2, and 3, and include Fitness for Duty (FFD) reports. As of January 3, 1990, FFD events are not reportable as safeguards events (are reported pursuant to 10 CFR 26.73).

Functional Areas
- A - Plant Operations
- B - Radiological Controls
- C - Maintenance/Surveillance
- D - Emergency Preparedness
- E - Security
- F - Engineering/Technical Support
- G - Safety Assessment/Quality Verification

The above data are based upon LERs 88-15 through 90-03.

TABLE 3B - Unit 2

SYNOPSIS OF LICENSEE EVENT REPORTS (LERs)

Functional Area		SALP Cause Code* A	B	C	D	E	X	Totals
A.	Plant Operations	9	4		3	2	3	21
B.	Radiological Controls					1		1
C.	Maintenance/ Surveillance	3	1		2			6
D.	Emergency Prep.							
E.	Security **	4						4
F.	Engineering/ Technical Support	1	4					5
G.	Safety Assessment/ Quality Verif.					1		1
	Totals	17	9		5	4	3	38

* Cause Code
- A - Personnel Error
- B - Design, Manufacturing or Installation Error
- C - External Cause
- D - Defective Procedures
- E - Component Failure
- X - Other

** One Security LER is applicable to Unit 2 only; the remaining three are applicable to Units 2 and 3. Security LERs include Fitness for Duty (FFD) reports. As of January 3, 1990, FFD events are not reportable as safeguards events (are reported pursuant to 10 CFR 26.73).

Functional Areas
- A - Plant Operations
- B - Radiological Controls
- C - Maintenance/Surveillance
- D - Emergency Preparedness
- E - Security
- F - Engineering/Technical Support
- G - Safety Assessment/Quality Verification

The above data are based upon LERs 88-27 through 89-23.

TABLE 3C - Unit 3

SYNOPSIS OF LICENSEE EVENT REPORTS (LERs)

Functional Area		SALP Cause Code* A	B	C	D	E	X	Totals
A.	Plant Operations	1			3	1	1	6
B.	Radiological Controls	1	1			2		4
C.	Maintenance/ Surveillance	2	1					3
D.	Emergency Prep.							
E.	Security							
F.	Engineering/ Technical Support		2					2
G.	Safety Assessment/ Quality Verif.							
	Totals	4	4		3	3	1	15

* Cause Code
- A - Personnel Error
- B - Design, Manufacturing or Installation Error
- C - External Cause
- D - Defective Procedures
- E - Component Failure
- X - Other

Functional Areas
- A - Plant Operations
- B - Radiological Controls
- C - Maintenance/Surveillance
- D - Emergency Preparedness
- E - Security
- F - Engineering/Technical Support
- G - Safety Assessment/Quality Verification

The above data are based upon LERs 88-09 through 90-01.

ATTACHMENT 1

ANALYSIS OF LICENSEE EVENT REPORTS (LERs)

PREPARED BY THE

OFFICE FOR ANALYSIS AND EVALUATION OF OPERATIONAL DATA

Enclosure

AEOD Input to SALP Review for San Onofre Unit 1

During the assessment period of October 1, 1988, to January 31, 1989, 34 LERs were submitted to the NRC. Our review encompassed LERs 88-15 through 89-28.

1. Important Operating Events

Utilizing AEOD's screening process, the following 14 Unit 1 LERs were categorized as important events:

LER 88-18: The structural integrity of 156 sleeved steam generator tubes might not have been in accordance with design requirements from the time they were installed in 1981 until they were plugged in December 1988. Eddy current testing methods, utilized at the time of sleeve installation, did not detect inadequate tube roll expansions. State-of-the-art eddy current testing technology was utilized to identify the problem tubes. (Event date: 12/12/88).

LER 88-19: Design deficiencies existed in the Train "B" automatic controls for the electrical power distribution system. Upon actuation of certain safeguard systems, unqualified non-safety related loads would not be isolated from the safety related portions of the distribution system. This condition could electrically overload the emergency diesel generator. With a main steam line break occurring in certain locations outside containment, spurious actuations and malfunctions of non-safety related loads could result in Train "A" voltage degradation and failure of the safety related Train "A" loads to start.

The design deficiencies were caused by placing excessive reliance on multiple contractors, and the lack of programs to compile, update, and verify design basis documents. A training program for supervisory personnel performing the review of engineering and technical work was initiated. (Event date: 12/13/88).

LER 88-20: Design requirements of post-TMI Action Plan (NUREG-0737) Item II.E.1.2, Part 2 were not fully implemented in the design of the steam generator wide-range level indication system. The level indicators (one per steam generator) were not powered from a battery-backed electrical power source, and the associated level transmitters, installed inside containment, were not environmentally qualified. The level indication system serves as one of two means providing auxiliary feedwater flow indication. The cause was attributed to weaknesses in the licensee's commitment management program. (Event date: 12/8/88).

LER 88-21: 8 of 33 containment fire protection system spray nozzles were found to be plugged, due to piping corrosion. Minor leakage of borated water through a spray isolation valve might have accelerated the

corrosion. Corrective actions included blowing the system with air to ensure corrosion products and blockage were completely removed, replacing nozzles with a non-clogging type, and performing air flow tests. (Event date: 12/12/88).

LER 89-01: Three reactor vessel thermal shield support block bolts were found to be protruding from the inner surface of the core barrel in excess of normal tolerances. Failure of the bolts was believed to have been caused by high-cycle flow induced vibration.

As corrective actions, accessible support features were inspected by remote video camera, and an engineering analysis was performed to support continued plant operation. Additionally, a conceptual design and plan for restoring the thermal shield supports was initiated. (Event date: 1/8/89).

LER 89-03: In response to NRC Generic Letter 88-14, the licensee determined that during a design basis LOCA, the component cooling water (CCW) control valves to the RHR heat exchangers could fail open due to either assumed 1) loss of instrument air or 2) loss of the electrical control power supply. This could result in a decrease in CCW flow to the recirculation heat exchanger to a value below that assumed in the safety analysis. Assuming a single failure which renders two CCW pumps inoperable, the remaining CCW pump could runout, creating a total loss of CCW.

The failure modes and effects analysis, performed in 1976, did not recognize the effects of failure of the CCW control valves. The licensee installed blocking devices on the control valves to limit the degree to which they can open. Flow tests were also performed to verify adequate flow distributions of CCW with one pump in operation. (Event date: 1/27/89).

LER 89-04: A design deficiency was identified in the automatic loading circuitry of the safety-related 4 kV buses. When the bus load sequencers initiate in response to a safety injection signal concurrent with a loss of offsite power, the loss of power latch is reset as soon as the diesel generator output breaker closes and voltage to the bus is restored. Consequently, if one bus is energized by a diesel generator in a shorter time than the other diesel generator, the loss of power latch in the load sequencer associated with the lagging diesel generator will be reset, and the output of the breaker for that diesel generator will not have the require logic to close.

Deficiencies with engineering review, design basis documentation, and post-modification testing caused the concern. A training program for supervisory personnel was initiated, and a design basis documentation program was established. (Event date: 3/2/89).

LER 89-07: Design provisions, intended to trip reactor in event of a reactor coolant pump (RCP) locked rotor, did not satisfy single failure criterion. The existing RCP over-current protection scheme was set-up to trip the RCP after a 24 second time delay. The time delay relay was not bypassed after the pump was running. Therefore, the pump protection scheme would not respond to a locked rotor condition for 24 seconds. Single failure analysis assumed the locked rotor (high current) trip would occur within 6 seconds.

The RCP over current protection settings were not reviewed during performance of the reactor protection system single failure analysis performed in 1987. Failure to detect the error resulted from absence of clear design basis documentation. (Event date: 2/27/89).

LER 89-08: Containment fire suppression system pneumatic control valve CV-92 could fail open due to a single spurious failure of the solenoid valve which controls CV-92. This failure could divert flow from the containment spray system during a LOCA, and result in containment pressure reaching a value greater than design pressure. The single failure analysis of the ECCS, performed in 1987, did not address failure of CV-92.

A design change was made to the CV-92 control circuitry to preclude opening due to a single failure. A single failure re-analysis of the ECCS and supporting systems was performed. A training program for supervisory personnel was also initiated. (Event date: 3/8/89).

LER 89-11: Upon initiation of safety injection, the main feedwater pumps (MFPs) realign to take suction from their respective SI trains and discharge into the RCS. MFP minimum flow valves, assumed to close within 21 seconds following safety injection actuation with loss of offsite power, would be delayed in closing due to wiring discrepancies, contrary to safety analysis. Accordingly, delivery of safety injection flow to the RCS would be below that assumed in the safety analysis.

The cause of this condition was inadequate implementation of design basis requirements. General engineering deficiencies, as described in previous LERs, contributed to this situation. The minimum flow system has been modified. (Event date: 3/23/89).

LER 89-14: Unlimited operation of the DC buses on cross-train chargers during the period 1977 through early 1989 (as allowed by existing technical specifications) was subsequently determined to have reduced the reliability of the onsite emergency electrical system during accident scenarios. In the event of a loss of offsite power, concurrent with failure of an emergency diesel generator, having the chargers previously aligned to the opposite trains could result in reduction of battery voltage and loss of control power to the other diesel generator within 90 minutes.

Operation of the buses under these conditions was caused by failure to develop appropriate technical specifications.

Design changes to separate the chargers have been completed. Inadequate engineering and technical work were causes of this event. (Event date: 4/5/89).

LER 89-24: The licensee determined that the plant could be placed in a configuration which could result in degraded containment spray system flow. If the containment spray system flow restricting valves were in a closed position, and a loss of non-safety related instrument air occurred, the spray system would be unable to perform its intended function. An emergency backup nitrogen supply to open the valves upon loss of instrument air should have been provided in the design.

Weak engineering design control and poor understanding of the design basis of the valves contributed to the problem. Technical specification changes were made to address the issue. Corrective actions associated with engineering weaknesses were described in similar LERs described above. (Event date: 9/29/89).

LER 89-25: Similar to LER 89-24, it was determined that the primary hot leg recirculation function was susceptible to loss of non-safety related instrument air. Two valves in the hot leg recirculation path would fail closed on loss of instrument air, resulting in a condition where boron precipitation in the core region could possibly occur. Weaknesses in licensing support to the plant were identified as the root cause of the event. A nitrogen backup supply to the instrument air system for the valves was added. (Event date: 10/12/89).

LER 89-26: Charging isolation valve CV-304 failed to close when provided with a close signal, rendering the valve inoperable. Entry into Technical Specification 3.0.3 was required, as the appropriate technical specification did not have an action statement for this situation. However, the required entry into TS 3.0.3 was not recognized until two days later.

In the event of a LOCA combined with a single failure of isolation valve FCV 1112 (isolates the RCS loop "A" cold leg, and auxiliary spray/hot leg recirculation paths) during the 21 hours CV-304 was inoperable, inadequate core cooling would have occurred.

Failure of the valve to close was attributed to failure of an Automatic Switch Co three-way solenoid air valve. The manufacturing process utilized Dow Corning 550 lubricant, which hardened with elevated temperatures. The valve was replaced. (Event date: 8/23/89).

2. Preliminary Notifications

Eight preliminary notifications (PNs) pertaining to Unit 1 were issued by Region V during the assessment period. For those events described in the PNs which warranted LERs from the licensee, the LERs were verified to have been submitted. No omissions were identified.

3. LER Overview

Causes of the events are distributed among various categories, however an inordinate number of the LERs were associated with design and design change programmatic deficiencies.

4. LER Timeliness and Quality

LERs submitted by the licensee were timely and of high quality, with the exception of LER 89-11. LER 89-11 indicated a supplemental LER was expected to be issued by June 16, 1989, however, it was not issued until December 5, 1989.

5. 10 CFR 50.72 Reports

Based upon preliminary information provided by the licensee in immediate notification reports submitted pursuant to 10CFR50.72, it appears additional LERs should have been submitted to the NRC in accordance with 10CFR50.73 on the following events:

EN 14598: Postulated overload of 480 volt switchgear 1 & 2 main feeder breaker following initiation of safety injection without loss of offsite power (Event Date: 1/30/89).

EN 15046: Automatic start of an emergency diesel generator when restoring the south circulating water pump to service (event date 3/17/89).

Region V should assess the need for additional 50.73 reports on these items.

6. Abnormal Occurrences and Other Events of Interest

No events occurring during this assessment period were classified as Abnormal Occurrences for inclusion in the NUREG-0090 report to Congress.

7. AEOD Reports

No AEOD reports were issued regarding events occurring at San Onofre Unit 1 during this evaluation period.

ENCLOSURE

AEOD Input To SALP Review For San Onofre 2 & 3

The Southern California Edison Company submitted licensee event reports for San Onofre Units 2 and 3 during the assessment period from October 1, 1988 to January 31, 1990. The reports for Unit 2 included LER numbers 361-88-028 through 361-88-037 and 361-89-001 through 361-89-011. The reports for Unit 3 included LER numbers 362-88-010 through 361-88-012 and 361-89-001 through 361-89-011. We reviewed those LERs and related event reports and our review findings are as follows:

1. Significant Operating Events

Based on the AEOD LER screening criteria, two of the unit 2 events during this period were found to be important from the safety standpoint. The events are as follows:

LER 361-88-034. On December 15, 1988, while operating at 100% power, it was determined that the unit 2 component cooling water system (CCWS) did not meet its design basis. Specifically, safety related systems should be designed to withstand the effects of natural phenomena such as earthquakes. However, components in the component cooling water system were powered by non-1E, non-seismic power supplies.

LER 361-89-004. On Feburary 9, 1989, unit 2 was taken critical with all four channels of the Core Protection Calculators (CPCs) inoperable. This was the result of a misunderstanding by the operators of the function of the CPC alarm and annunciator lights.

None of the events at San Onofre during this time period was determined to be an abnormal occurrence.

2. Emergency Notification Reports

The 50.72 reports for this period were evaluated and compared to the LERs submitted. It was found that LERs had been submitted where appropriate for events described in 50.72 reports for San Onofre units 2 and 3.

3. AEOD Technical Study Reports

None of the events at San Onofre during the time period of this assessment was the subject of an in-depth technical study by AEOD.

4. Preliminary Notifications of Event or Occurrence

Six PNOs were issued during the period of the assessment. They are as follows:

PNO-V-88-062; on 881119, an earthquake occurred 30 miles west of San Clemente.

PNO-V-89-004; on 890106, a reactor trip and safety injection actuation occurred at Unit 3. It was caused by failure of a non-1E power supply due to a ground jumper. The jumper was removed and steam generator level sensing lines blown down for sludge accumulation. (This was later reported in LER 362-89-001.

PNO-V-89-006; on 890111, a plant shutdown of Unit 2 was required by technical specifications due to an inoperable motor-driven auxiliary feedwater pump. (This was later reported in LER 361-89-001.)

PNO-V-89-008; On 890118, a magnitude 5 earthquake occurred 8 miles south of Malibu.

PNO-V-89-014; on 890209, panel annunciators illuminated before the Unit 2 startup which indicated the core protection calculators were inoperable, but the crew observed that the console indications were normal. (This was later reported in LER 361-89-004.)

PNO-V-89-023; on 890407, a magnitude 4.6 earthquake occurred near Newport Beach. Unit 1 reported no damage.

PNO-V-89-025; on 890407, Unit 3 went into an unscheduled shutdown for more than 48 hours. This was caused by a reactor trip due to a drop in voltage on the rod drive bus after a breaker trip, an atmospheric dump valve not operating properly, and a leak in the vent line. (This was later reported in LER 362-89-006.)

PNO-V-89-028; on 890512, a primary-to-secondary leak rate of 117 gallons per day occurred at Unit 3. On 890513, steam generator blowdown radiation monitor indication increased one decade. The reactor was to be shutdown and drained to mid-loop to repair the leaking tube(s).

PNO-V-89-038; on 890629, excessive shaft leakage was identified while performing inservice testing of a LPSI pump at Unit 3. (This was reported in LER 362-89-008.)

PNO-V-89-068; on 891201, a hydrogen fire in the radwaste building occurred during changeout of a relief valve on a waste gas decay tank. There were no injuries, no equipment damage, and no release of radioactive material.

It appears that LERs have been submitted where required for events described by the Region in PNOs.

5. LER Quality

The LERs described the major aspects of the events, including component or system failures that were contributing factors.